## REMARKS

Reconsideration of the above-identified patent application in view of the remarks following is respectfully requested.

Claims 1-19 are pending in the application. In the Office Action dated September 11, 2007, claims 1-19 were rejected. The rejection is respectfully traversed.

The invention in the above-identified patent application discloses a method and system for preventing deadlock in communication between a host software application and a network interface card (NIC). The method includes writing a doorbell associated with at least one descriptor having a descriptor context to a buffer in the NIC, dropping at least one doorbell from the buffer if the buffer is full, thereby allowing a write of a new doorbell to the buffer, and recovering each dropped doorbell for further execution of descriptors associated with this doorbell. The descriptor execution is in order of posting by the application to the NIC. The invention enables the use of <u>a single logical communication path common to doorbell writes and context read responses</u> without a kernel call and facilitates unsynchronized, kernel-call-free, unrestricted traffic along the single common paths.

The invention in the above-identified patent application lists the problems associated with commonly used protocols/systems in its Background section. In one commonly used protocol, application software (SW) writes a descriptor to system memory and writes a doorbell that prompts the NIC HW to execute this descriptor. The doorbell is written to a doorbell buffer, preferably a FIFO buffer. The NIC reads the queue pair (QP) context from a locally attached (directly attached to the NIC) memory and the descriptor is executed. The doorbell writes acceptance by the NIC HW is unconditional - the basic assumption is that each doorbell write is accepted as it arrives. The system makes sure that read responses needed to process this doorbell use a different path than writes, thus preventing deadlock. However, this commonly used system has a main disadvantage in the need for an additional, separate memory attached to the NIC.

Prior art systems that use a single write/read path were known and were discussed in the above-identified patent application In such a system, the software must guarantee that the doorbell FIFO buffer is never full. This guarantee is provided by synchronizing all consumers through the OS, i.e. <u>by using a kernel call</u>. Disadvantageously, this implies

restricted access to the NIC HW, and inherent increased overhead requirements. d that provided user level

In summary, prior to the above-identified patent application, solutions to the DB write/QP context read response deadlock problem were based either on the use of separate write and read response paths, or on synchronization between consumers using a kernel call. The main disadvantage of the first solution is the need for the additional, separate memory attached to the NIC. The main disadvantages of the second solution are restricted access to the NIC and additional overhead. The solution provided by this invention - user level, kernel-free access to the NIC together with a single write/read response logical path - was previously unknown.

## § 102 Rejections

Claims 1-19 were rejected under 35 U.S.C. 102(b) as being anticipated by Kagan et al. (hereinafter Kagan), US Publication No. 2002/0165897. The rejection is respectfully traversed.

Kagan discloses a NIC that provides a host processor with two complementary modes of submitting descriptors to be executed by the adapter: a normal mode, in which the host writes descriptors to a system memory and rings an assigned doorbell to notify the adapter; and a priority mode, in which the host writes the descriptor itself to a doorbell address of the adapter. In the priority mode, the adapter is relieved of the need to read the descriptor from the memory, and can thus begin execution as soon as it has resources available to do so. Because the adapter typically has limited buffer space available to hold descriptors awaiting processing, the host is preferably programmed to restrict its own use of the priority mode.

Kagan lists two different buffers used in his method and included in the NIC: a doorbell buffer (FIFO) 44 and a priority (descriptor) buffer 46. While the priority (descriptor) buffer may be emptied of its contents, doorbell buffer 44 never drops any doorbell. The "dropping" of doorbells is irrelevant to Kagan's invention and therefore never mentioned or discussed. This is one key difference between Kagan and the invention in the above-identified patent application. Therefore:

In reference to claim 1, Examiner states that Kagan teaches a method/system comprising the step of "if said buffer is full, dropping at least one doorbell from said

4

buffer, thereby allowing a write of a new doorbell to said buffer", referring to paragraph 13 in Kagan. As indicated above, Applicant respectfully submits that Kagan does not teach a method/system comprising a step of dropping at least one <u>doorbell</u> from a <u>doorbell buffer</u>. Paragraph 13 in Kagan deals with descriptor buffer 46, not doorbell buffer 44. There is absolutely no mention or indication any where in Kagan of a doorbell being dropped if a doorbell buffer is full. Therefore, Kagan cannot and does not anticipate the invention claimed in claim 1. Moreover, Kagan cannot and does not even render the invention claimed in claim 1 unpatentable.

Claim 2-8 depend directly or indirectly from claim 1 and include all of its limitations. Therefore, Kagan cannot and does not anticipate the invention claimed in claims 2-8, because each of these claims includes a limitation not disclosed by Kagan.

In reference to claim 9, Examiner states that Kagan teaches a method/system including providing a single logical communication path common to doorbell writes and context read responses [paragraph 7]. Applicant submits that paragraph 7 in Kagan does not relate to Kagan's invention, but to the general state of InfiniBand, being part of the Background section. The "single logical path" recited in claim 9 refers to logical path 432 in FIG. 4. Applicant respectfully submits that there is nothing in Kagan which is in any way even remotely related to a "single logical communication path common to doorbell writes and context read responses" such as logical path 432. Therefore Kagan cannot and does not anticipate the invention claimed in claim 9. Moreover, Kagan cannot and does not even render the invention claimed in claim 9 unpatentable. Similarly, Kagan cannot and does not anticipate the invention claimed in any of claims 10-14, which depend directly or indirectly from claim 9 and include all of its limitations.

In reference to claim 15, the Examiner states that Kagan teaches a system comprising all three elements recited in the claim, citing paragraphs 7 and 52 for element (a) and paragraph 52 for elements (b) and (c). Applicant respectfully submits that paragraph 52 in Kagan is completely silent about a "single logical path" such as path 432. There is nothing in Kagan which is in any way even remotely related to a "NIC configured to accept doorbell rings and context read responses through a single logical path" such as logical path 432. Therefore Kagan cannot and does not anticipate the invention claimed in claim 15. Moreover, Kagan cannot and does not even render the invention claimed in claim 15 unpatentable. Similarly, Kagan cannot and does not

5

anticipate the invention claimed in any of claims 16-18, which depend directly from claim 15 and include all of its limitations.

In reference to claim 19, the Examiner states that Kagan teaches a method/system comprising: responsive to a first check, dropping at least one doorbell from the doorbell buffer if the buffer is full, thereby providing space in the buffer for a respective at least one new doorbell [paragraph 13, lines 11-18]; recovering each dropped doorbell and executing its respective associated descriptors [paragraph 13]; and responsive to same said first check, if said doorbell buffer is not full, checking if a doorbell is a repeat doorbell, and executing descriptors of each doorbell found to be not a repeat doorbell [paragraphs 14 and 54]. As argued above, paragraph 13 in Kagan deals with a descriptor buffer, not a doorbell buffer. There is absolutely no mention or indication any where in Kagan of a doorbell being dropped if a doorbell buffer is full. Therefore, Kagan cannot and does not anticipate the invention claimed in claim 19. Moreover, Kagan cannot and does not even render the invention claimed in claim 19 unpatentable.

In view of the above amendments and remarks it is respectfully submitted that claims 1-19 are now in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully Submitted

Mark M. Friedman
Attorney for Applicant
Registration No. 33,883

Date:   February 25, 2008

6